DEPARTMENT OF ELECTRICAL ENGINEERING
The Ohio State University
Course Syllabus

EE 832 | **High Speed Semiconductor Devices** | **Winter 2008**

Prerequisite: EE730 or EE432 with instructor permission

Textbook: High-Speed Heterostructure Devices, P. Roblin and H. Rohdin, *Cambridge University Press*, 2002

Instructor: Patrick Roblin, 292-0998, Room 379 Caldwell Lab

Tentative Lecture Schedule: B0 428, MWF 10:30 am

Office Hours: By appointment. Otherwise use e-mail for lecture and homework questions

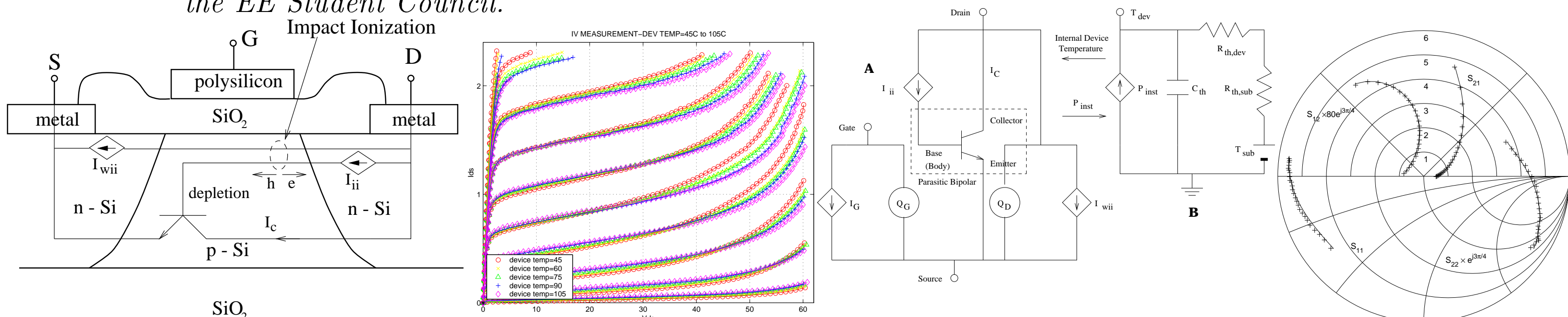
Course Plan:

- 1. Introduction on Heterostructure Devices. Semi-Classical Theory, HBT.
- 2. Quantum Theory of Heterostructures and Quantum Heterostructure Devices (Quantum well, RTD, superlattice)
- 3. Scattering Processes and Scattering-Assisted Tunneling in Heterostructures Devices and High-Frequency Response of Quantum Devices (RTD, Infrared laser)
- 4. Charge Control of the Two-Dimensional Electron Gas in HEMT
- 5. High Electric-Field Transport in Semiconductor Devices
- 6. Current Voltage Models of the Short-Channel MOSFET, HEMT,SOI and LDMOS
- 7. MOSFET Wave-Equation. Microwave Modeling and Electrothermal effects.
- 8. Noise modeling. On wafer microwave measurement.
- 9. High-Frequency Heterojunction Bipolar Transistors
- 10. Non-linear RF measurement and modeling. Impact of thermal and electrical memory effect on linearization.

Grading Scheme: HW: 1/3, Take home midterm: 1/3, Take home Final: 1/3

Class Webpage: http://eewww.eng.ohio-state.edu/∼roblin/ee832.html

All examinations in this course will be administered in accordance with the EE Honor System. If you have a question about the EE Honor System, contact your instructor or a member of the EE Student Council.



2008 Special Topics:

Modeling and Measurement of Transistors for RFIC and high-power RF PA

- GaN HEMTs: physics, modeling and high-power density applications
- Non-linear RF characterization with a Large Signal Network Analyzer
- Impact of memory effects (self-heating & traps on transistor load-lines
- Pulsed-IV pulsed-RF measurements as a probe of device physics
- On-wafer RF measurement and deembedding
- Thermal and 1/f noise and impact on oscillator performance